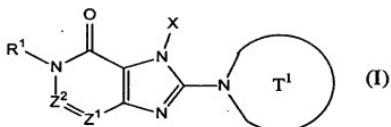


CLAIMS

1. A compound represented by the following formula, or a salt or
hydrate thereof,

5



wherein,

10 T¹ represents a monocyclic or bicyclic 4- to 12-membered heterocyclic group containing one or two nitrogen atoms in the ring, that may have one or more substituents;

15 X represents a C₁₋₆ alkyl group which may have one or more substituents, a C₂₋₆ alkenyl group which may have one or more substituents, a C₂₋₆ alkynyl group which may have one or more substituents, a C₆₋₁₀ aryl group which may have one or more substituents, a 5 to 10-membered heteroaryl group which may have one or more substituents, a C₆₋₁₀ aryl C₁₋₆ alkyl group which may have one or more substituents, or a 5 to 10-membered heteroaryl C₁₋₆ alkyl group which may have one or more substituents;

20 Z¹ and Z² each independently represent a nitrogen atom or a group represented by the formula -CR²=;

25 R¹ and R² each independently represent a group according to the formula -A⁰-A¹-A²

30 (wherein A⁰ represents a single bond or a C₁₋₆ alkylene group which may have 1 to 3 substituents selected from group B consisting of the substituents described below;

A¹ represents a single bond, an oxygen atom, a sulfur atom, a sulfinyl group, a sulfonyl group, a carbonyl group, a

group represented by the formula $-O-CO-$, a group represented by the formula $-CO-O-$, a group represented by the formula $-NR^A-$, a group represented by the formula $-CO-NR^A-$, a group represented by the formula $-NR^A-CO-$, a group represented by the formula $-SO_2-NR^A-$, or a group represented by the formula $-NR^A-SO_2-$;

5 A^2 and R^A each independently represent a hydrogen atom, a halogen atom, a cyano group, a C_{1-6} alkyl group, a C_{3-8} cycloalkyl group, a C_{2-6} alkenyl group, a C_{2-6} alkynyl group, a C_{6-10} aryl group, a 5 to 10-membered heteroaryl group, a 4 to 8-membered heterocyclic group, a 5 to 10-membered heteroaryl C_{1-6} alkyl group, a C_{6-10} aryl C_{1-6} alkyl group, or a C_{2-7} alkylcarbonyl group;

10 however, A^2 and R^A each independently may have 1 to 3 substituents selected from the substituent group B described below:

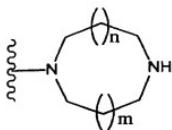
15 when Z^2 is a group represented by the formula $-CR^2=$, R^1 , and R^2 may in combination form a 5 to 7-membered ring;

20 except in cases where: [1] R^1 is a hydrogen atom; Z^1 is a nitrogen atom; and Z^2 is $-CH=$; and [2] Z^1 is a nitrogen atom; and Z^2 is $-C(OH)=$;

25 <Substituent group B>
 Substituent group B represents the group consisting of: a hydroxyl group, a mercapto group, a cyano group, a nitro group, a halogen atom, a trifluoromethyl group, a C_{1-6} alkyl group which may have one or more substituents, a C_{3-8} cycloalkyl group, a C_{2-6} alkenyl group, a C_{2-6} alkynyl group, a C_{6-10} aryl group, a 5 to 10-membered heteroaryl group, a 4 to 8-membered heterocyclic group, a C_{1-6} alkoxy group, a C_{1-6} alkylthio group, a group represented by the formula $-SO_2-NR^{B1}-R^{B2}$, a group represented by the formula $-NR^{B1}-CO-R^{B2}$, a group represented by the formula $-NR^{B1}-R^{B2}$ (where R^{B1} and R^{B2} each independently represent a hydrogen atom or a C_{1-6}

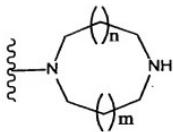
alkyl group), a group represented by the formula $-CO-R^{B3}$ (where R^{B3} represents a 4 to 8-membered heterocyclic group), a group represented by the formula $-CO-R^{B4}-R^{B5}$ and a group represented by the formula $-CH_2-CO-R^{B4}-R^{B5}$ (where R^{B4} represents a single bond, an oxygen atom, or a group represented by the formula $-NR^{B6}-$; R^{B5} and R^{B6} each independently represent a hydrogen atom, a C_{1-6} alkyl group, a C_{3-8} cycloalkyl group, a C_{2-6} alkenyl group, a C_{2-6} alkynyl group, a C_{6-10} aryl group, a 5 to 10-membered heteroaryl group, a 4 to 8-membered heterocyclic C_{1-6} alkyl group, a C_{6-10} aryl C_{1-6} alkyl group, or a 5 to 10-membered heteroaryl C_{1-6} alkyl group)).

2. The compound according to claim 1, or a salt or hydrate thereof, wherein T^1 is, a group represented by the following formula:



(wherein, n and m each independently represent 0 or 1) which may have one or more substituents; an azetidin-1-yl group which may have one or more substituents; a pyrrolidin-1-yl group which may have one or more substituents; a piperidin-1-yl group which may have one or more substituents; or an azepan-1-yl group which may have one or more substituents.

3. The compound according to claim 1, or a salt or hydrate thereof, wherein T^1 is, a group represented by the following formula :



(where n and m each independently represent 0 or 1);

an azetidin-1-yl group which may have an amino group;

5 a pyrrolidin-1-yl group which may have an amino group;

a piperidin-1-yl group which may have an amino group; or

an azepan-1-yl group which may have an amino group.

4. The compound according to claim 1, or a salt or hydrate thereof,
10 wherein T¹ is a piperazin-1-yl group or a 3-aminopiperidin-1-yl group.

5. The compound according to claim 1, or a salt or hydrate thereof,
wherein T¹ is a piperazin-1-yl group.

15 6. The compound according to any one of claims 1 to 5, or a salt or
hydrate thereof, wherein X is a group represented by the formula -X¹-X²
(where X¹ represents a single bond or a methylene group which may have
one or more substituents; X² represents a C₂₋₆ alkenyl group which may have one or
20 more substituents, a C₂₋₆ alkynyl group may have one or more
substituents, or a phenyl group which may have one or more
substituents).

25 7. The compound according to any one of claims 1 to 5, or a salt or
hydrate thereof, wherein X is a group represented by the formula
-X¹¹-X¹² (where X¹¹ represents a single bond or a methylene group; X¹²
represents a C₂₋₆ alkenyl group, a C₂₋₆ alkynyl group, or a phenyl group
which may have one or more substituents).

30 8. The compound according to claim 6 or 7, or a salt or hydrate thereof,
wherein the phenyl group that may have one or more substituents is
a phenyl group which may have at the 2-position a substituent selected
from the group consisting of a hydroxyl group, a fluorine atom, a

chlorine atom, a methyl group, an ethyl group, a fluoromethyl group, a vinyl group, a methoxy group, an ethoxy group, an acetyl group, a cyano group, a formyl group, and a C₂₋₇ alkoxy carbonyl group.

- 5 9. The compound according to any one of claims 1 to 5, or a salt or
hydrate thereof, wherein X is a 3-methyl-2-buten-1-yl group, a
2-butyn-1-yl group, a benzyl group, or a 2-chlorophenyl group.
- 10 10. The compound according to any one of claims 1 to 5, or a salt
or hydrate thereof, wherein X is a 2-butyn-1-yl group.
11. The compound according to any one of claims 1 to 10, or a salt
or hydrate thereof, wherein either the Z¹ or Z² is a nitrogen atom.
- 15 12. The compound according to any one of claims 1 to 10, or a salt
or hydrate thereof, wherein,
Z¹ is a nitrogen atom; and
Z² is a group represented by the formula -CR²=
(where R² is as defined above in claim 1).
- 20 13. The compound according to any one of claims 1 to 10, or a salt
or a hydrate thereof, wherein,
Z² is a nitrogen atom; and
Z¹ is a group represented by the formula -CR²=
(where R² is as defined above in claim 1).
- 25 14. The compound according to any one of claims 1 to 13, or a salt
or hydrate thereof,
wherein R¹ represents a hydrogen atom, or a group represented by the
formula -A¹⁰-A¹¹-A¹²
(where A¹⁰ represents a C₁₋₆ alkylene group which may have 1 to
3 substituents selected from the substituent group C described
below;
A¹¹ represents a single bond, an oxygen atom, a sulfur atom or
a carbonyl group;
A¹² represents a hydrogen atom, a C₆₋₁₀ aryl group which may have

1 to 3 substituents selected from the substituent group C described below, a 5 to 10-membered heteroaryl group which may have 1 to 3 substituents selected from the substituent group C described below, a 5 to 10-membered heteroaryl C_{1-6} alkyl group which may have 1 to 3 substituents selected from the substituent group C described below, or a C_{6-10} aryl C_{1-6} alkyl group which may have 1 to 3 substituents selected from the substituent group C described below:

10 <Substituent group C>

Substituent group C represents the group consisting of: a hydroxyl group, a nitro group, a cyano group, a halogen atom, a C_{1-6} alkyl group, a C_{1-6} alkoxy group, a C_{1-6} alkylthio group, a trifluoromethyl group, a group represented by the formula $-NR^{C1}-R^{C2}$ (where each of R^{C1} and R^{C2} independently represent a hydrogen atom or C_{1-6} alkyl group), a group represented by the formula $-CO-R^{C3}-R^{C4}$ and a group represented by the formula $-CH_2-CO-R^{C3}-R^{C4}$ (where R^{C3} represents a single bond, an oxygen atom, or a group represented by the formula $-NR^{C5}-$; R^{C4} and R^{C5} each independently represent a hydrogen atom or a C_{1-6} alkyl group).

15. The compound according to any one of claims 1 to 13, or a salt or hydrate thereof,

20 wherein R^1 is a hydrogen atom, a C_{1-6} alkyl group which may have 1 to 3 substituents selected from the substituent group C described below, a 5 to 10-membered heteroaryl C_{1-6} alkyl group which may have 1 to 3 substituents selected from the substituent group C described below, or a C_{6-10} aryl C_{1-6} alkyl group which may have 1 to 3 substituents selected from the substituent group C described below:

25 <Substituent group C>

Substituent group C represents the group consisting of: a hydroxyl group, a nitro group, a cyano group, a halogen atom, a C_{1-6} alkyl group, a C_{1-6} alkoxy group, a C_{1-6} alkylthio group, a trifluoromethyl group, a group represented by the formula $-NR^{C1}-R^{C2}$ (where each of R^{C1} and R^{C2} independently represent a

hydrogen atom or a C₁₋₆ alkyl group), a group represented by the formula -CO-R^{C3}-R^{C4} and a group represented by the formula -CH₂-CO-R^{C3}-R^{C4} (where R^{C3} represents a single bond, an oxygen atom, or a group represented by the formula -NR^{C5}-; R^{C4} and R^{C5} each independently represent a hydrogen atom or a C₁₋₆ alkyl group);

5 16. The compound according to claim 14 or 15, or a salt or hydrate thereof, wherein the substituent group C is a group consisting of
10 a cyano group, a C₁₋₆ alkoxy group, a C₂₋₇ alkoxycarbonyl group, and a halogen atom.

15 17. The compound according to any one of claims 1 to 13, or a salt or hydrate thereof, wherein R¹ is a methyl group, a cyanobenzyl group, a fluorocyanobenzyl group, a phenethyl group, a 2-methoxyethyl group, or a 4-methoxycarbonylp偷idin-2-yl group.

20 18. The compound according to any one of claims 1 to 13, or a salt or hydrate thereof, wherein R¹ is a methyl group or a 2-cyanobenzyl group.

25 19. The compound according to any one of claims 1 to 18, or a salt or hydrate thereof,
 wherein R² is a hydrogen atom, a cyano group, or a group represented by the formula -A²¹-A²²

30 (where A²¹ represents a single bond, an oxygen atom, a sulfur atom, a sulfinyl group, a sulfonyl group, a carbonyl group, a group represented by the formula -O-CO-, a group represented by the formula -CO-O-, a group represented by the formula -NR^{A2}-,
 a group represented by the formula -CO-NR^{A2}-, or a group represented by the formula -NR^{A2}-CO-;

35 A²² and R^{A2} each independently represent a hydrogen atom, a cyano group, a C₁₋₆ alkyl group, a C₃₋₈ cycloalkyl group, a C₂₋₆ alkenyl group, a C₂₋₆ alkynyl group, a C₆₋₁₀ aryl group, a 5- to 10-membered heteroaryl group, a 4- to 8-membered heterocyclic group, a 5- to 10-membered heteroaryl C₁₋₆ alkyl group, or a C₆₋₁₀ aryl C₁₋₆

alkyl group;

however, A²² and R^{A2} each may independently have 1- to 3 substituents selected from the substituent group D described below:

5 <Substituent group D>

Substituent group D represents the group consisting of: a hydroxyl group, a cyano group, a nitro group, a halogen atom, a C₁₋₆ alkyl group, a C₁₋₆ alkoxy group, a C₁₋₆ alkylthio group, a trifluoromethyl group, a group represented by the formula -NR^{D1}-R^{D2} (where R^{D1} and R^{D2} each independently represent a hydrogen atom or a C₁₋₆ alkyl group), a group represented by the formula -CO-R^{D3} (where R^{D3} represents a 4 to 8-membered heterocyclic group), and a group represented by the formula -CO-R^{D4}-R^{D5} (where R^{D4} represents a single bond, an oxygen atom, or a group represented by the formula -NR^{D6}-; R^{D5} and R^{D6} each independently represent a hydrogen atom, a C₃₋₈ cycloalkyl group, or a C₁₋₆ alkyl group)).

20. The compound according to any one of claims 1 to 18, or a salt 20 or hydrate thereof,

wherein R² represents a hydrogen atom, a cyano group, a carboxy group, a C₂₋₇ alkoxy carbonyl group, a C₁₋₆ alkyl group, a group represented by the formula -CONR^{D7}R^{D8} (where R^{D7} and R^{D8} each independently represent a hydrogen atom or a C₁₋₆ alkyl group), or a group represented by the 25 formula -A²³-A²⁴

(where A²³ represents an oxygen atom, a sulfur atom or a group represented by the formula -NR^{A3}-;

A²⁴ and R^{A3} each independently represent a hydrogen atom, a C₁₋₆ alkyl group which may have a substituent selected from the substituent group D1 described below, a C₃₋₈ cycloalkyl group which may have a substituent selected from the substituent group D1 described below, a C₂₋₆ alkenyl group which may have a substituent selected from the substituent group D1 described below, a C₂₋₆ alkynyl group which may have a substituent selected from the substituent group D1 described below, a phenyl group which may have a substituent selected from the substituent group 30 35

D1 described below, or a 5 to 10-membered heteroaryl group which may have a substituent selected from the substituent group D1 described below:

<Substituent group D1>

5 Substituent group D1 represents the group consisting of: a carboxy group, a C₂₋₇ alkoxy carbonyl group, a C₁₋₆ alkyl group, a group represented by the formula -CONR^{D7}R^{D8} (where R^{D7} and R^{D8} each independently represent a hydrogen atom or C₁₋₆ alkyl group), a pyrrolidin-1-yl carbonyl group, a C₁₋₆ alkyl group, and a C₁₋₆ alkoxy group).

10 21. The compound according to any one of claims 1 to 18, or a salt or hydrate thereof,

15 wherein R² represents a hydrogen atom, a cyano group, a C₁₋₆ alkoxy group, or a group represented by the formula -A²⁵-A²⁶

(where A²⁵ represents an oxygen atom, a sulfur atom, or a group represented by the formula -NR^M-;

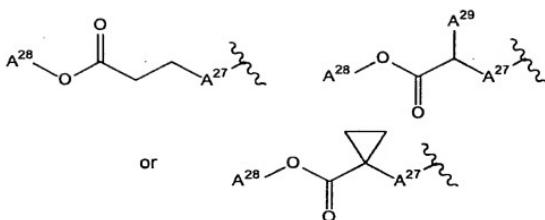
20 A²⁶ and R^M each independently represent a hydrogen atom, a C₁₋₆ alkyl group having a substituent selected from the substituent group D1 described below, a C₃₋₈ cycloalkyl group having a substituent selected from the substituent group D1 described below, or a phenyl group having a substituent selected from the substituent group D1 described below:

<Substituent group D1>

25 Substituent group D1 represents the group consisting of: a carboxy group, a C₂₋₇ alkoxy carbonyl group, a C₁₋₆ alkyl group, a group represented by the formula -CONR^{D7}R^{D8} (where R^{D7} and R^{D8} each independently represent a hydrogen atom or a C₁₋₆ alkyl group), pyrrolidin-1-yl carbonyl group, a C₁₋₆ alkyl group, and a C₁₋₆ alkoxy group).

30 22. The compound according to any one of claims 1 to 18, or a salt or hydrate thereof,

35 wherein R² is a hydrogen atom, a cyano group, a methoxy group, a carbamoylphenyloxy group, or a group represented by the following formula:



(where A²⁷ represents an oxygen atom, a sulfur atom, or -NH-;
 5 A²⁸ and A²⁹ each independently represent a hydrogen atom or a C₁₋₆ alkyl group).

23. The compound according to any one of claims 1 to 18, or a salt or hydrate thereof, wherein R² is a hydrogen atom, a cyano group, or
 10 a 2-carbamoylphenoxy group.

24. The compound according to claim 1, or a salt or hydrate thereof, wherein the compound of formula (I) indicated above is any one selected from the group consisting of:

- 15 7-(2-butynyl)-2-cyano-1-methyl-8-(piperazin-1-yl)-1,7-dihydropurin-6-one,
 3-(2-butynyl)-5-methyl-2-(piperazin-1-yl)-3,5-dihydroimidazo[4,5-d]pyridazin-4-one,
 2-(3-aminopiperidin-1-yl)-3-(2-butynyl)-5-methyl-3,5-dihydroimidazo[4,5-d]pyridazin-4-one,
 2-[7-(2-butynyl)-1-methyl-6-oxo-8-(piperazin-1-yl)-6,7-dihydro-1H-purin-2-yloxy]benzamide,
 7-(2-butynyl)-1-(2-cyanobenzyl)-6-oxo-8-(piperazin-1-yl)-6,7-dihydro-1H-purine-2-carbonitrile, and
 25 2-[3-(2-butynyl)-4-oxo-2-(piperazin-1-yl)-3,4-dihydroimidazo[4,5-d]pyridazin-5-ylmethyl]benzonitrile.

25. A pharmaceutical agent comprising a compound of claim 1.

26. A dipeptidyl peptidase IV inhibitor comprising a compound of claim 1.
27. A pharmaceutical composition comprising a compound of claim 1 and an adjuvant useful for formulation.
28. A preventive or a therapeutic agent for diabetes mellitus, which comprises a compound of claim 1.
- 10 29. A preventive or therapeutic agent, which comprises a compound of claim 1, for diabetes mellitus, obesity, hyperlipidemia, AIDS, osteoporosis, a gastrointestinal disorder, angiogenesis, infertility, an inflammatory disease, an allergic disease, or cancer.
- 15 30. An immunomodulator, a hormone modulator, or an anti-rheumatic drug, which comprises a compound of claim 1.
31. A therapeutic or preventive method for a disease in which the inhibition of dipeptidyl peptidase IV is effective, wherein the method comprises administering to a patient a compound of claim 1, or a salt or hydrate thereof, in a pharmaceutically effective amount.
- 20
32. The use of a compound of claim 1, or a salt or hydrate thereof, in producing a pharmaceutical agent.
- 25 33. The use of a compound of claim 1, or a salt or hydrate thereof, in producing a therapeutic or preventive agent for a disease in which the inhibition of dipeptidyl peptidase IV is effective.